WHAT IS CLAIMED IS:

1. A method for depositing a film on a substrate disposed in a substrate processing chamber, the substrate having a trench formed between adjacent raised surfaces, the method comprising:

depositing a first portion of the film over the substrate from a first gaseous mixture flowed into the processing chamber by chemical-vapor deposition;

thereafter, etching the first portion by flowing an etchant gas comprising a halogen precursor, a hydrogen precursor, and an oxygen precursor into the process chamber; and

thereafter, depositing a second portion of the film over the substrate from a second gaseous mixture flowed into the processing chamber by chemical-vapor deposition.

2. The method recited in claim 1 wherein the hydrogen precursor comprises H_2.

3. The method recited in claim 1 wherein the halogen precursor comprises a fluorine precursor.

4. The method recited in claim 3 wherein the fluorine precursor comprises NF_3.

5. The method recited in claim 4 wherein:

the substrate includes a silicon nitride layer; and

etching the first portion comprises adjusting a flow rate of the hydrogen precursor and a flow rate of the NF_3 to control a relative concentration of NO and F in the processing chamber.

6. The method recited in claim 3 wherein the fluorine precursor comprises F_2.

7. The method recited in claim 3 wherein the fluorine precursor comprises SiF_4.

8. The method recited in claim 1 wherein the hydrogen precursor and the oxygen precursor are comprised by a single compound.

9. The method recited in claim 8 wherein the single compound is H_2O.

10. The method recited in claim 8 wherein the single compound is H_2O_2.

11. The method recited in claim 1 wherein etching the first portion comprises maintaining a plasma formed from the etchant gas.

12. The method recited in claim 11 wherein the plasma is a high-density plasma.

13. The method recited in claim 11 wherein the etchant gas further comprises an inert sputtering agent.

14. The method recited in claim 13 wherein the inert sputtering agent comprises Ar.

15. The method recited in claim 13 wherein the inert sputtering agent comprises He.

16. The method recited in claim 13 wherein etching the first portion is performed with a sputter/removal ratio between 0.0 and 0.8, the sputter/removal ratio corresponding to a ratio of a volume of material removed by sputtering to a total volume of material removed by a combination of sputtering and chemical etching.

17. The method recited in claim 11 wherein:

depositing the first portion of the film comprises maintaining a plasma formed from the first gaseous mixture; and

depositing the second portion of the film comprises maintaining a plasma formed from the second gaseous mixture.

18. The method recited in claim 11 further comprising biasing the plasma towards the substrate.

19. The method recited in claim 1 wherein etching the first portion comprises flowing the hydrogen precursor at different flow rates to different parts of the processing chamber to effect a radially nonuniform etching distribution over the substrate.

20. A method for depositing a silicate glass film on a substrate disposed in a substrate processing chamber, the substrate having a trench formed between adjacent raised surfaces, the method comprising:

depositing a first portion of the silicate glass film over the substrate by forming a plasma from a first gaseous mixture flowed into the processing chamber, the first gaseous mixture comprising a silicon-containing gas and an oxygen-containing gas;

thereafter, etching the first portion by forming a plasma from an etchant gas mixture flowed into the processing chamber, the etchant gas mixture comprising a fluorine-containing gas, H_2, and O_2; and

thereafter, depositing a second portion of the silicate glass film over the substrate by forming a plasma from a second gaseous mixture flowed into the processing chamber, the second gaseous mixture comprising the silicon-containing gas and the oxygen-containing gas.

21. The method recited in claim 20 wherein the fluorine-containing gas comprises NF_3.

22. The method recited in claim 21 wherein:

the substrate includes a silicon nitride layer; and

etching the first portion comprises adjusting flow rates of the NF_3, H_2, and O_2 to control a relative concentration of NO and F in the processing chamber.

23. The method recited in claim 20 wherein the etchant gas mixture further comprises an inert sputtering agent.

24. The method recited in claim 20 wherein etching the first portion further comprises biasing the plasma formed from the etchant gas towards the substrate.

25. The method recited in claim 20 wherein etching the first portion comprises flowing the H_2 at different flow rates to different parts of the processing chamber to effect a radially nonuniform etching distribution over the substrate.

26. A method for depositing a film on a substrate disposed in a substrate processing chamber, the substrate having a trench formed between adjacent raised surfaces, the method comprising:

depositing a first portion of the film over the substrate by forming a plasma from a first gaseous mixture flowed into the processing chamber;

thereafter, etching the first portion by forming a plasma from an etchant gas mixture flowed into the processing chamber, the etchant gas mixture comprising a first precursor gas reactive with the film, a second precursor gas reactive with the first precursor gas, and an inert sputtering agent flowed into the processing chamber at respective flow rates to control relative isotropic and anisotropic contributions to the etching; and

thereafter, depositing a second portion of the film by forming a plasma from a second gaseous mixture.

27. The method recited in claim 26 wherein etching the first portion further comprises biasing the plasma formed from the etchant gas towards the substrate.

28. The method recited in claim 26 wherein etching the first portion comprises flowing the second precursor gas to provide a different distribution within the processing chamber than the first precursor gas, thereby effecting a nonuniform etching distribution over the substrate.